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Title Page

Out-of-hospital cardiac arrests in the older population in Ireland

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Contributorship statement

Richard Tanner - Lead author. Collected data, completed literature review, constructed data tables, completed statistical analysis and coordinated input from co-authors

Siobhan Masterson - contributed to planning/methodology of project. Provided guidance on statistical analysis. Significant contribution to writing final draft.

Mette Jensen - contributed to initial planning/methodology and literature review of project. Involved in editing of final project draft.

Peter wright - involved in planning and gave key input from a public health point of view. Involved in editing and correction of project.

David Hennelly- national ambulance service (NAS). Provided up to date information on initiatives by the NAS for OHCAs. Ensured information regarding the NAS was accurate. Provided editing on final draft of project

Martin O'Reilly - represented the Emergency Medical Services in Dublin and provided practical guidance from his experience as part of the National Ambulance Service. Involved in editing each draft before submission to EMJ.

Andrew W Murphy - input from a General Practitioner's point of view. Highlighted information that would be useful in day to day practice. Provided editing before final draft submitted

Gerard Bury - input on drafting presentation of results and writing final draft of this paper.

Cathal O'Donnell- represented the national ambulance service (NAS) and provided information the structure of the NAS and interventions being used to improve outcomes from OHCA. Also involved in editing of project,

Conor Deasy - Project supervisor. Involved in all steps of project; from initial planning to presentation of data to final edits

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Out-of-hospital cardiac arrests in the older population in
Ireland

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**On behalf of the Out of Hospital Cardiac Arrest Register Steering
Committee**

Abstract

Introduction

Age influences survival from an out of hospital cardiac arrest (OHCA) but it is unclear to what extent. Improved understanding of the impact of increasing age may be helpful in improving decision-making on who should receive attempted resuscitation to optimise outcomes and minimise inappropriate end-of-life management. Our aim is to describe the demographics, characteristics and outcomes following resuscitation attempts in OHCA patients aged 70 years and older in the Republic of Ireland.

Methods

Data was extracted from the national Out of Hospital Cardiac Arrest Register (OHCAR). Patient and event characteristics were compared across three age categories (70-79; 80-89; ≥ 90 years).

Multivariable logistic regression was used to determine the predictors of the primary outcome (survival to hospital discharge).

Results

A total of 2,281 patients aged 70 years and older were attended by emergency medical services and had resuscitation attempted between 2012 and 2014. Overall survival to hospital discharge was 2.9%. For those aged 70-79 years, 80-89 years, 90 years and older survival to hospital discharge in each age group was 4.0%, 1.8% and 1.4% respectively. Older age (AOR 0.95 95%CI: 0.90-0.99) and having an arrest in the subjects own home (AOR 0.14 95%CI: 0.07-0.28) were independent predictor associated with reduced odds of survival to hospital discharge. An initial shockable rhythm (AOR 17.9. 95%CI: 8.19-39.2) and having a bystander witnessed OHCA (AOR 3.98. 95%CI: 1.38-11.50) were independent predictors associated with increased odds of survival to hospital discharge.

Conclusion

In those aged 70 years and older, the rate of survival to hospital discharge declined with increasing age group. Younger age, an initial shockable rhythm and witnessed arrest were independent predictors of survival to hospital discharge.

What this paper adds:**What is already known:**

Overall survival to hospital discharge in Ireland after EMS attended OHCA with resuscitation attempted is 6%. OHCA outcomes specific to the older Irish population have not been studied. Perception of likely OHCA outcomes may influence success of attempted resuscitation.

What might this study add:

This study analyses the factors influencing outcomes in non-EMS witnessed OHCA attended and treated by the EMS in the Republic of Ireland in those aged 70 years and older.

Survival to hospital discharge for those aged 70-79 years, 80-89 years, 90 years and older was 4.0%, 1.8% and 1.4% for each age group respectively. Age, having an OHCA in the subjects own home, having an initial shockable rhythm and having a bystander-witnessed OHCA were independent predictors of survival to hospital discharge.

Introduction

The older population is an important subgroup of out-of-hospital cardiac arrest (OHCA) patients whose outcomes merit scrutiny. Favourable outcomes have been recorded in this group despite advancing age.¹⁻³ To date, the incidence, management and outcomes from OHCA in the Irish elderly population have not been a focus of study. Like other developed countries Ireland has an ageing population; the number of Irish people aged over 70 years increased by 10.1% from 2006 to 2011.⁴

A key aspect of optimising OHCA outcomes is patient selection i.e. ensuring that those who undergo this aggressive treatment have a chance of benefiting from it. The higher incidence of OHCA in the elderly population compared to the general population makes this sub-group central to this consideration.² The ethical principles of autonomy, beneficence, non-maleficence and justice need to be carefully considered when selecting patients for attempted resuscitation, yet the practicalities of this are challenging.⁵ Prognostication in the pre-hospital environment is also very challenging.⁶ Having specific age-related information on OHCA outcomes may provide clinicians with additional insights that can support decisions made during resuscitation.

The perceived outcome after CPR influences a patient's resuscitation preference in the event of a cardiac arrest.⁷ Knowledge of anticipated age specific outcomes after OHCA may also enable patients and families to make more informed decisions regarding end of life care for the future.

Location is known to influence OHCA outcomes.^{1,3} Compared to OHCA in the home, OHCA in residential institutions for the elderly have lower rates of bystander CPR and survival to hospital discharge.^{8,9} OHCA in the expanding elderly Irish population living in residential institutions have not been previously studied.⁴

The aim of this study is to describe the demographics, characteristics and outcomes for patients aged 70 years or older in the Republic of Ireland who suffered an OHCA that was attended by the statutory Emergency Medical Services (EMS) and where resuscitation was attempted. We also aim to identify key predictors of survival to hospital discharge in the older population and examine OHCA occurring in residential institutions.

Methods

Data source

Data was obtained from the Irish Out-of-Hospital Cardiac Arrest Register (OHCAR).¹⁰ OHCAR is hosted by the Department of Public Health Medicine in the Health Service Executive (HSE) North West. It is administered by the Discipline of General Practice, National University of Ireland Galway and is funded by The National Ambulance Service (NAS) and Pre-Hospital Emergency Care Council (PHECC). OHCAR was formed in 2007 and since 2012 has full national coverage. The register is comprised of all patients who suffer an out-of-hospital cardiac arrest which is confirmed and attended by Emergency Services. OHCA that do not have resuscitation attempted are not included in the register. Data is collected using the Utstein template data set thus allowing comparison with other international registries.¹¹

Patient Care Reports (PCRs), which are completed by paramedics and dispatch data obtained from Emergency Control Centres provide the majority of raw data for the OHCAR register. Outcome data is also collected for patients transferred to hospital. Missing case identification is undertaken on a quarterly basis to capture cases not directly reported to OHCAR. All information undergoes validation before being entered onto the register.¹²

Population statistics were calculated using data from the 2011 census. In 2011, the population of Ireland was 4,588,252.⁴ A high proportion of Ireland's population lived in rural area (defined as the population residing in all areas outside clusters of 1500 or more inhabitants); 1,741,363 (38%) compared the European average of 22.3%.^{13,14} The proportion of Irish people living in residential institutions increased with each additional year above 70 years of age, in the 2011 census. Overall 13% of those aged 70 years and older lived in residential institutions in 2011.⁴

EMS in Ireland

The NAS is the sole provider of statutory EMS outside of Dublin where the Dublin Fire Brigade (DFB) also provides a statutory EMS response. There are currently three tiers of clinical practitioner whose licensing and practice is directed by PHECC; Emergency Medical Technicians, Paramedics and Advanced Paramedics. An Advanced Medical Priority Dispatch System (AMPDS) is used nationally to systematically categorise and prioritise calls to the NAS and DFB. Dispatch assisted telephone bystander CPR instructions are used nationally.

The OHCA protocols are based on the recommendations of the International Liaison Committee on Resuscitation (ILCOR) adapted to Ireland as PHECC Clinical Practice Guidelines (CPG). The PHECC CPGs advise CPR and rhythm assessment in those identified as being in cardiac arrest unless there are definitive indicators of death (decomposition, rigor mortis, injuries incompatible with life

etc.). If a patient is unresponsive, has no signs of life and remains in asystole after three cycles of two-minute duration CPR the CPGs recommend to consider ceasing resuscitation.¹⁴

Subjects

OHCA cases that occurred in patients aged 70 years and older from 1st January 2012 to 31st December 2014 were included. The older population was defined as those aged 70 years and older to allow comparison of data with recent studies which used the same age groups to analyse OHCA in the older population.^{1,3,8} In keeping with similar studies EMS witnessed cases were excluded.^{1,2} Aetiology of OHCA was classified as medical unless it was known or likely to have been caused by trauma, submersion, drug overdose, asphyxia, electrocution, or any other non-cardiac cause as evident from the PCR. Attempted resuscitation was defined by evidence that chest compressions had been attempted during the event.

Outcomes

OHCA were categorised according to age (70-79 years, 80-89 years, ≥ 90 years) to allow a comparison with previously published data on OHCA in the elderly.^{1,3} Cases were excluded if age was unknown. A sub-group analysis was undertaken for those aged 70 years and over who lived in a residential institution and outcomes were compared to previous studies. The primary outcome for this study was survival to hospital discharge. Return of Spontaneous Circulation (ROSC) pre-hospital was a secondary outcome.

Ethical approval

Ethical approval was granted by the Cork Research Ethics Committee (reference no. ECM 4 (x) 14/04/15).

Statistics

Descriptive analysis was performed using IBM SPSS Statistics 20.0. Median values and inter-quartile ranges (IQR) were calculated for EMS response time and age. The characteristics of OHCA for those aged 70 years and older and living in a residential institution were examined in a sub-group analysis. Binary logistic regression was performed to determine the predictors of the main outcome (survival to hospital discharge) for the entire cohort. Each potential variable was considered separately to obtain odds ratios for the individual effect of each predictor on the main outcome. All predictor variables used in the univariate analysis were used in the multivariable analysis to obtain adjusted odds ratios.

Age and EMS response times were included as continuous covariates; all remaining covariates were categorical. For the regression analysis age was entered as individual years and EMS response time was entered as minutes.

Results

A total of 2,281 OHCA in those aged 70 years and over were attended by EMS and had resuscitation attempted in Ireland from 1st January 2012 to 31st December 2014. This equates to an unadjusted incidence of 210/100,000 population aged 70 years and over per year.

Case characteristics and outcomes

Table 1 describes the Utstein data elements characterising OHCA. Of these 1,177 (51.6%) were aged 70-79 years, 887 (38.9%) were aged 80-89 years, and 217 (9.5%) were aged 90 years or over. There was a male predominance overall. A total of 1,405 cases (61.6%) were witnessed by a bystander. CPR before EMS arrival was performed on 63.4% of those aged 70-79 years, 59% of those aged 80-89 years and 58.5% of those aged 90 years and older. The median EMS call-response time was 13 minutes (IQR 8-20 minutes). As age group increased the proportion of OHCA occurring in a public place decreased and the number of OHCA occurring in a residential institution increased. The proportion of cases that occurred at in the subjects own home was lower in the 90 years and older group compared to the 70-79 years old group (62.7 versus 72 %). Asystole was the most common presenting rhythm in all age groups.

Table 1: Utstein-based Patient and Event Characteristics Categorised by Age Group

	All ≥70 years n = 2,281	70-79 years n = 1,177	80-89 years n = 887	≥90 years n = 217
Age median (IQR) years	79 (74-85)	74 (72-77)	84 (82-86)	92 (90-93)
Female sex n(%)	872 (38.2)	397 (33.7)	365 (42.1)	110 (50.7)
Location of arrest				
- Home n(%)	1,606 (70.4)	847 (72.0)	623 (70.2)	136 (62.7)
- Residential Institution n(%)	324 (14.2)	95 (8.1)	162 (18.3)	67 (30.9)
- Public place n(%)	296 (13.0)	192 (16.3)	89 (10.0)	13 (6.0)
Aetiology				
- Medical n(%)	2,206 (96.7)	1,128 (95.8)	869 (98.0)	209 (96.3)
- Other (non-cardiac) n(%)	75 (3.3)	49 (4.2)	18 (2.0)	8 (3.7)
Bystander witnessed OHCA n(%)	1,405 (61.6)	735 (62.4)	536 (60.4)	134 (61.7)
Bystander CPR before EMS arrival n(%)	1,396 (61.2)	746 (63.4)	523 (59.0)	127 (58.5)
EMS response time [Median (IQR) minute]	13 (8-20)	13 (8-21)	13 (8-21)	12 (7-18)
First monitored rhythm				
Shockable n(%)	441 (19.3)	269 (22.9)	149 (16.8)	23 (10.6)
- VF/pulseless VT n(%)	359 (81.4)	221 (82.2)	118 (79.2)	20 (87.0)
- Unknown (shock advised) n(%)	82 (18.6)	48 (17.8)	31 (20.8)	3 (13.0)
Non-shockable n(%)	1,752 (76.8)	862 (73.2)	707 (79.7)	186 (85.7)
- Asystole n(%)	1,195 (68.2)	607 (70.4)	467 (66.1)	121 (65.0)
- PEA n(%)	312 (17.8)	131 (15.2)	157 (22.2)	24 (12.9)
- Unknown (No shock advised) n(%)	248 (14.2)	124 (14.4)	83 (11.7)	41 (22.0)
Outcome where resuscitation attempted				
- Survived to hospital discharge n(%)	66 (2.9)	47 (4.0)	16 (1.8)	3 (1.4)
- ROSC at any stage pre-hospital n(%)	486 (21.3)	283 (24.0)	172 (19.4)	31 (14.3)
Survival based on initial rhythm analysed				
Shockable n(%)	57 (12.9)	41 (15.2)	14 (9.4)	2 (8.7)
- VF/pulseless VT n(%)	39 (10.9)	30 (13.6)	8 (6.8)	1 (5.0)
- Unknown (shock advised) n(%)	18 (21.9)	11 (22.9)	6 (19.4)	1 (33.3)
Non-shockable n(%)	7 (0.4)	5 (0.6)	1 (0.1)	1 (0.5)
- Asystole n(%)	1 (0.1)	1 (0.2)	0 (0.0)	0 (0.0)
- PEA n(%)	3 (1.0)	2 (1.5)	0 (0.0)	1 (4.2)
- Unknown (no shock advised) n(%)	3 (1.2)	2 (1.6)	1 (1.2)	0 (0.0)

IQR – inter-quartile range, VT–ventricular tachycardia, VF- Ventricular fibrillation, PEA-pulseless electrical activity, OHCA-out-of-hospital cardiac arrest, EMS-emergency medical services.

Return of spontaneous circulation (ROSC) was achieved pre-hospital in 24.0% of those aged 70-79 years, 19.4% for those aged 80-89 years and 14.3% for those aged 90 years and older. Overall 2.9% of patients survived to hospital discharge. For those aged 70-79 years, 80-89 years, 90 years and older survival to hospital discharge in each age group was 4.0%, 1.8% and 1.4% respectively.

Overall survival to hospital discharge was 12.9% if the first rhythm was shockable and 0.4% if the first rhythm was non-shockable. A shockable initial rhythm was associated with improved survival to hospital discharge irrespective of age group (30.20 CI 14.8-61.5); 15.2% of those aged 70-79 years, 9.4% of those aged 80-89 years and 8.7% of those aged ≥ 90 year survived if the presenting rhythm was shockable. Survival to hospital discharge based on non-shockable initial rhythm was 0.6% for those aged 70-79 years, 0.1% for those aged 80-89 years and 0.5 % for those aged ≥ 90 years. Less than 0.1% of those aged 70 years and older survived to hospital discharge if asystole was the initial rhythm analysed.

OHCA Residential institutions

The proportion of OHCA occurring in a residential institution for the elderly increased for each successive age group, see Table 1. A total of 324 OHCA occurred in a residential institution during the study period. Table 2 shows that this sub-group of OHCA had a witnessed OHCA in 62.6% of cases and CPR before EMS arrival in 79.9% of cases. A shockable initial rhythm was present in 11.1% of cases. Overall survival to discharge for this sub-group was 2.2%.

Table 2 OHCA in Residential institutions

Age group	All ≥70years n = 324	70-79 years n = 95	80-89 years n = 162	≥90 years n = 67
Resuscitation attempted n(%)	324 (100.0)	95 (100)	162 (100)	67 (100)
Female n(%)	173 (53.4)	44 (46.3)	94 (58.0)	35 (52.2)
Medical aetiology n(%)	311 (96.0)	88 (92.6)	158 (97.5)	65 (97)
Bystander Witnessed OHCA n(%)	203 (62.6)	63 (66.3)	97 (59.9)	43 (64.2)
CPR before EMS arrival n(%)	259 (79.9)	76 (80.0)	132 (81.5)	51 (76.1)
Shockable initial rhythm n(%)	36 (11.1)	10 (10.5)	20 (12.3)	6 (8.9)
Discharged alive n(%)	7 (2.2)	1 (1.1)	4 (2.5)	2 (3.0)

OHCA-out-of-hospital cardiac arrest, EMS-emergency medical services. CPR-cardio-pulmonary resuscitation

The association of potential predictor variables with the outcome survival to hospital discharge is summarised in Table 3. Older age was found to be an independent predictor of reduced odds of survival to hospital discharge (AOR 0.95 CI: 0.90-0.99). Patients who had an OHCA with an initial shockable rhythm (AOR 17.9 CI: 8.19-39.20) or a witnessed OHCA (AOR 3.98 CI: 1.38 – 11.50) had a greater likelihood of survival to hospital discharge. However, bystander CPR (AOR 1.26 CI: 0.58 – 2.72) was associated with a reduced chance of survival to hospital discharge. Having an OHCA in the subject's own home had a considerably worse outcome than arrests outside the home (AOR 0.14 CI: 0.07-0.28).

Table 3: Logistic regression analysis of predictors of the outcome survival to hospital discharge in patients ≥ 70 years (n=2,443).^a

Predictors	Univariate analysis		Multivariable analysis	
	OR (95%CI)	[P-value]	AOR (95% CI)	[P-value]
Age (years)	0.93 (0.89-97) *	[0.001]	0.95 (0.90-0.99) *	[0.03]
Female	0.46 (0.26-0.83)*	[0.010]	1.04 (0.53-2.03)	[0.91]
Bystander Witnessed OHCA	7.90 (3.2-19.7)*	[<0.001]	3.98 (1.38-11.50) *	[0.01]
Bystander CPR OHCA	3.70 (1.8-7.2)*	[<0.001]	1.26 (0.58-2.72)	[0.56]
Shockable initial rhythm	30.20 (14.8-61.5)*	[<0.001]	17.92 (8.19-39.20) *	[<0.001]
OHCA at subjects own home	0.09 (0.05-0.16)*	[<0.001]	0.14 (0.07- 0.28) *	[<0.001]
EMS response time (minutes)	0.96 (0.93-0.99)*	[0.02]	0.97 (0.94 –1.01)	[0.08]

OHCA-out-of-hospital cardiac arrest, EMS-emergency medical services. CPR-cardio-pulmonary resuscitation

^aOdds ratio (OR), adjusted odds ratio (AOR) and 95% Confidence interval (CI) in the older population (≥ 70 years)

Discussion

This study analyses the factors influencing outcomes in 2,281 cardiac arrests attended and treated by the EMS in the Republic of Ireland. Older age was an independent predictor of survival to hospital discharge after OHCA for this cohort.

Survival to discharge after OHCA was 2.9% for those aged 70 years and over. This is less than survival to hospital discharge rate for OHCAs in the general Irish population (2.9% versus 6%).¹⁰ There is a degree of heterogeneity in the internationally reported rates of survival to hospital discharge after OHCA in the elderly population. A recent study in the Netherlands recorded a survival to hospital discharge rate of 12% and a Swedish study reported a 30-day survival after OHCA of 6.7% for those aged 70 years and older.^{1,3} A number of factors likely contribute to Ireland's lower survival rates. The large proportion of the population living in rural areas and protracted EMS response times represent challenges to improving outcomes in OHCA in Ireland. Our study found that only 25% of OHCAs had EMS on scene within 8 minutes of being requested. This is compared to a median response time of 7 minutes recorded in both Melbourne and Sweden for a similar cohort of patients.^{2,3} Delayed defibrillation is likely if EMS are not present and robust community first responder

programmes are not in place. Notably, a large proportion (52.4%) of our study population had asystole recorded as their initial rhythm. This may reflect the progression over time from a shockable to non-shockable rhythm due to delayed defibrillation. Given the known poor outcome associated with asystole overall poorer OHCA outcomes are anticipated. The Dutch study recorded a much greater proportion of patients to have a shockable initial rhythm (36%) compared to 19.3% of OHCA in our study, hence better outcomes are not surprising.¹ Identifying ways to overcome these challenges should improve outcomes from OHCA in Ireland, and are the subject of an active NAS quality improvement initiative entitled the OneLife Project.¹⁵

In keeping with previous studies a shockable initial first rhythm was found to make the most significant contribution to survival in OHCA.¹⁻³ One study on those aged 70 years and older found that if the initial rhythm was shockable survival was 20% in the 70-79 years' group, 15% in the 80-89 years group and 11% if those aged 90 years or over.³ However, lower survival rates were recorded for each age group in our study even if the initial rhythm was shockable.

Non-shockable rhythms, in particular asystole carry a bleak prognosis. Our study found that 0.1% of OHCA survived to hospital discharge if the initial rhythm analysed was asystole. This survival rate is lower than recorded in other similar international studies.^{2,3} Medical futility is sometimes considered when an intervention is unlikely to produce any significant benefit for the patient. The threshold for medical futility is not clearly defined and is dependent on the treatment involved.¹⁶ Studies have suggested that therapies with less than a 1% to 5% chance of successful outcome be considered futile.¹⁶ A recent Melbourne study suggested that there was no benefit in transporting to hospital an EMS witnessed OHCA with an initial non-shockable rhythm who does not achieve ROSC in the field.¹⁷

Bystander CPR and defibrillation rates

Early initiation of CPR when appropriate is fundamental in the cardiac arrest chain of survival.¹⁸ CPR before EMS arrival in the older population has been shown to be effective at increasing survival after an OHCA.⁴ Interestingly in contrast to other studies on similar age groups, a positive impact of bystander CPR was not observed in the multivariable analysis for our study.^{2,3} This may be explained by the elapsed time to initiation of bystander CPR or the quality of bystander CPR, both of which were not assessed.

As has been previously noted the single most important factor in resuscitation of an OHCA with a shockable rhythm is early defibrillation.^{18,19} Each minute without CPR and defibrillation reduces the chance of survival by 7-10%.¹⁹ Our study highlights that a shockable initial rhythm remains highly

significant as a factor for survival to hospital discharge after OHCA in the older population. Nationwide availability of AEDs and educating laypersons on their use has been shown to improve outcomes in shockable OHCA.^{20,21} A 2015 study found that widespread deployment of static AEDs in Ireland was unlikely to be cost effective.²² To improve cost effectiveness this study recommends, targeted AED deployment in higher incidence locations in combination with improving public awareness, increasing community basic life support training and establishing an EMS-linked AED register.²² The strategic placement of AEDs in areas with an older age profile may increase AED use in the older population and reduce the time to first defibrillation attempt.

Training community first responders (CFR) in the use of AEDs can optimise outcomes from community based AEDs. CFRs could be an integral part of the chain of survival. Upon receipt of a 999/112 call CFRs are alerted via short message service (SMS) from the NAS National Computer Aided Dispatch System and dispatched simultaneously with the NAS. CFR programmes are not widely available in Ireland at present. Expansion of this integrated community response system is being actively worked on and should improve bystander CPR rates and reduce the elapsed time from cardiac arrest recognition to first defibrillation.²³ Smart phone applications such as GoodSAM (Smartphone Activated Medics) offer further promise in reducing the elapsed time to initiation of CPR and defibrillation after an OHCA is identified.²⁴ This application uses Global Positioning System technology to engage the nearest certified medically trained volunteer to this time-critical emergency. This technology is being integrated into the London Ambulance Service at present.²⁴

OHCA in Residential Institutions

This study found that for patients aged 70 years and older the proportion of cases occurring in residential institutions increased for each age group. The overall rate of survival to hospital discharge for this sub-group is similar to a Melbourne study which examined patients in the same age group in residential aged care facilities (2.2% compared to 2.1% in Melbourne).⁸

Over 20% of OHCA had no CPR before EMS arrival which is high considering that these are residential institutions staffed by clinically trained personnel. Previous studies have found that the use of CPR and defibrillators in nursing homes is low.^{8,9} This may represent an uncertainty among staff as to whether it was appropriate to start CPR on an elderly patient. The EMS was requested to each of these cases highlighting that the need for an active resuscitation attempt was assumed. Residential institutions need to develop both definitive resuscitation and end of life care pathways. Patient care pathways that involve Advanced Care Directives (ACD) and Do Not Attempt Resuscitate (DNAR) orders can offer clarity to medical staff when a cardiac arrest does occur. Furthermore, this planned approach to end of life care may prevent inappropriate activation of EMS.

The OHCA and end of life planning

A resuscitation attempt is not suitable for every OHCA. It may be distressing for the family and ultimately it may undermine the care of a dying patient.²⁵ The new Assisted Decision Making (Capacity) Act 2016 clarifies the role of ACDs in Ireland.²⁶ A specific refusal of treatment set out in an ACD is as effective as if made contemporaneously by the directive maker when he or she had capacity to make the decision. An ACD can help guide EMS and clinicians in these difficult situations. Importantly, an ACD may prevent unwanted resuscitation of a dying patient.

The ethics of resuscitation and end of life decisions are addressed in the European Resuscitation Council Guidelines for Resuscitation 2015.⁵ An informed patient centred healthcare approach is emphasised to enable greater patient autonomy. The new guidelines recognise disparity in the legal status of advance directives in the national legislation of European countries and the need for harmonisation in legislation and practice.⁵ The data on age related survival in OHCA provided by this study can further enable people to make an informed decision around end of life planning. It should also prompt individuals, families and healthcare professionals to engage in these important meaningful discussions.

Limitations

This study has a number of limitations due to its retrospective nature. The OHCA register does not include OHCA in which resuscitation is not attempted. Thus, the total number of cardiac arrests per annum is not determined. In addition, this study is a sub-group analysis and thus outcomes are not applicable to the general population. The study does not adjust for co-morbidities associated with age progression as reliable data is not available. Furthermore, no information was available on the number of DNARs in residential institutions. Quality of life after hospital discharge was not assessed in this study.

Conclusion

Older age in those aged 70 years and older was associated with a lower likelihood of survival to hospital discharge after OHCA. An initial shockable initial rhythm and having a bystander witnessed OHCA were independent predictors associated with increased odds of survival to hospital discharge. Appreciation of age related survival in an OHCA may help clinicians make informed decisions around resuscitation and end of life management

Conflicts of interest

There are no conflicts of interest to declare.

Competing Interests

There are no competing interests between authors

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